

## **REMARKS**

### **I. STATUS OF CLAIMS**

Claims 1-4 and 7-10 are pending in the application.

Claims 1-4 and 7-10 stand rejected.

Claims 11 and 12 stand allowed.

Claims 1 and 9 have been amended herein. No new matter has been added.

### **II. ALLOWABLE SUBJECT MATTER**

Applicant, through his attorney, wishes to thank the examiner for the indication of allowable subject matter in claims 11 and 12.

Applicant wishes to continue the prosecution of claims 1-4 and 7-10, for as will be shown with regard to the rejection under 35 USC §103, applicant believes that claims 1-4 and 7-10, should also be allowed based on the remarks and amendments made herein.

### **III. AMENDMENT AFTER FINAL**

Although the last Office Action was made final, the amendment made to claims 1 and 9 should be entered. The amendments to claims 1 and 9 are made to more clearly state the invention claimed. No new issues are raised by the amendments that would require further consideration by the examiner.

The amendment therefore should be entered without requiring a showing under 37 CFR 1.116(b).

### **IV. REJECTION UNDER 35 USC §103**

The examiner rejected claims 1-4 and 7-8 under 35 USC §103 as being unpatentable over Yuge (USP No. 5,182,091) in view of German Patent De 29 24 584. It is the examiner's position that "Yuge disclosed a method for purifying silicon which comprises directing a plasma jet of an

inert gas toward the surface of molten silicon held in a container lined with silica or a silica refractory and stirring said molten silicon, said inert gas being mixed with 0.1-10 vol % steam. ... Yuge does not specifically disclose plasma, which is generated by an inductive plasma torch. DE '584 discloses a process of producing silicon for solar cells by introducing silica or Si with a higher degree of contamination into a reducing gas atmosphere in a plasma. The plasma is preferred to be an inductive plasma instead of an arc torch in order to avoid contaminating the molten silicon. It would have been obvious ... to use an inductive plasma instead of an arc plasma, as suggested by De'584 in the process of Yuge because of the inductive plasma would avoid contaminating the molten silicon." With regard to claims 9-10, these claims were rejected under 35 USC 103(a) as being unpatentable over Yuge in view of De '584 and Hiratake (USP No. 4,048,436). It is the examiner's position that Yuge and De '584 are applied as stated above [i.e., with regard to claims 1-4 and 7-9]. ... Hiratake discloses that an inductively produced plasma can be enlarged by subjecting the plasma to the rotating magnetic field generated by the rotating magnetic field generating means. ... It would have been obvious ... to enlarge the plasma in Yuge by using a rotating magnetic field as suggested by Hiratake because an enlarged plasma with a wide and homogeneous temperature distribution can be obtained and the wider the plasma the more surface it can treat."

Applicant respectfully disagrees with, and explicitly traverses, the examiner's reasons for rejecting the claims. Applicant respectfully submits that the examiner is misreading Yuge as Yuge discloses "a container lined with silica or a silica-based refractory" (see abstract, and col. 2, lines 8 or line 21). The use of lined container precisely means that it concerns a hot crucible. On the contrary, a cold crucible is not lined with a refractory material as its walls are made of metal cooled with water. Hence, the terms "hot" and "cold" are terms of art and do not refer to the temperature of the crucible. Further, according to Yuge, the steering of the silicon melt is

produced by an arc-induced high-temperature, high-velocity plasma jet. However, according to the present invention, the steering of the silicon melt is produced by the inductive winding around the crucible. .

Notwithstanding the above argument, applicant, through his attorney has amended independent claims 1 and 9 to more clearly state the invention. More specifically, applicant has amended claims 1 and 9 to recite that the crucible is an “unlined” crucible rather than a “cold” crucible.

A claimed invention is prima facie obvious when three basic criteria are met. First, there must be some suggestion or motivation, either in the reference themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings therein. Second, there must be a reasonable expectation of success. And, third, the prior art reference or combined references must teach or suggest all the claim limitations.

Yuge discloses a “contained lined with silica or a silica-based refractory” (see col. 2, line 8 and lines 21-22). Yuge further notes that “[p]urification is accomplished by the removal of boron and carbon in the form of oxides. Oxygen to form oxides is furnished from the container wall of silica or silica-based refractory as the molten silicon is stirred. Silica constituting the container wall or crucible lining prevents the entrance of impurities into silicon, furnishes oxygen, and functions as the reaction site for carbon removal. Therefore, **silica is indispensable** (emphasis added) for carbon removal.” (See col. 2, lines 45-53). Accordingly, the Yuge device considers the lining of the crucible to be an essential component in the process. One would not look to Yuge to develop a method using an unlined crucible, as is recited in the present invention, as a lined crucible is essential to the teaching of Yuge. And, removal of this essential component would alter and interfere with the method claimed by Yuge.

Having shown that one would not look to Yuge to develop the novel feature of the present invention as recited in claim 1, one skilled in the art would not be motivated to combine the teaching of Yuge and DE '584 as suggested by the examiner. Similarly, with regard to claim 9, one skilled in the art would not be motivated to combine the teaching of Yuge, DE '584 and Hiratake as suggest by examiner.

Having shown that neither Yuge, DE '584 nor Hiratake, teach, disclose or provide the motivation for one skilled in the art to develop the novel features of the present invention, applicant submits that the examiner's reasons for rejecting claims 1 and 9 have been overcome and can no longer be sustained. Applicant respectfully requests reconsideration, withdrawal of the rejection and allowance of the claims.

With regard to claims 2-4, 7-8 and 10, these claims ultimately depend from and include all the subject matter disclosed in independent claims 1 and 9, respectively. Accordingly, these claims are believed to be allowable by virtue of their dependence upon allowable base claims.

## **V. CONCLUSION**

Having addressed the examiner's rejection of the claims, applicant submits that the reasons for the examiner's rejection have been overcome. Applicant respectfully requests reconsideration, withdrawal of the objection and rejection and a Notice of Allowance regarding claims 1-12 be issued.

Applicant submits that the substance of the originally filed claims has not been amended. The amendments made to the claims were not made to overcome any prior art cited by the Examiner but rather made to more clearly state the invention. Accordingly, the amendments made are not related to patentability and do not alter or limit the substance of the subject matter claimed.

If the examiner believes that the prosecution of this matter may be advanced by a telephone call, the examiner is invited to contact applicant's attorney at the telephone number indicated below.

**VI. FEES**

A petition for a one month extension of time to file this response, up until and including January 9, 2003, and this firm's check to cover the cost of filing the petition are attached hereto. Accordingly, this response is deemed timely filed.

No other fees are believed necessary for filing this election and response. However, the Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment that may be associated with this communication to Duane Morris, LLP deposit account 50-2061.

Respectfully submitted,

Dated: \_\_\_\_\_

1/9/03

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CAG:



**VERSION WITH MARKINGS TO CLEARLY SHOW CHANGES MADE**

**IN THE CLAIMS**

Kindly **AMEND** the claims as follows:

1. (Twice Amended) A silicon refining method comprising the steps of:  
filling [a cold] an unlined inductive crucible (1) with solid silicon;  
melting the content of the crucible;  
creating, by means of the inductive crucible, a turbulent stirring of the silicon melt (b) by  
bringing the liquid from the bottom of the crucible to the free surface by ascending along the  
central axis of the crucible; and  
directing a plasma (f) generating by an inductive plasma torch (2) towards the melt  
surface for a duration enabling elimination of impurities for which the reactive gas (g<sub>r</sub>) of the  
plasma is adapted.
  
9. (Thrice Amended) A silicon refining installation comprising:  
[a cold] an unlined inductive crucible (1) adapted to receiving the silicon;  
an inductive plasma torch (2) directed towards the free surface of the silicon load  
contained in the crucible; and  
a removable magnetic yoke (3) between the plasma torch (2) and the crucible (1) for  
inverting a stirring direction of the silicon load, the yoke being ring-sharped to enable the passing  
of the plasma flame (f).

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